

# Communicating the Opportunities of Military Service to the Youth Market

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**Abstract** — The war on terror began on October 7<sup>th</sup>, 2001 and has cost over 3,000 soldiers their lives. The perceived promise of a “long war” along with casualties creates a significant enlistment barrier. The Army recently launched a new brand, “Army Strong,” which appeals to the markets’ value system and counters war related barriers to enlistment. Currently, the Army doesn’t possess a system for modeling new recruiting campaigns. Using the United States Military Academy’s System Design Process: problem definition, solution design, decision making, and solution implementation; we created an Army Opportunities Communication Model (AOCM). The AOCM modifies the Bass Diffusion Model by adding value parameters to existing advertising effectiveness and word of mouth parameters. Specifically, we model values in national advertising, recruiter effectiveness, and word of mouth advertising (hype). The recruiting effectiveness parameters measure how recruiters, money, college funds, length of service contract, location, and the availability of different military occupational specialties affects recruiting. Bass Diffusion models typically model and describe how new products are adopted into the market. Frank Bass introduced the Bass Diffusion Model in 1969 when he published his paper “A new product growth for model consumer durables,” and it has been widely influential in marketing and management science since its’ introduction [1]. The AOCM allows stakeholders to analyze the effectiveness of each parameter. This data can be used to modify the current or future recruiting campaigns to achieve better performance. Modeling results are pending. Contributions include the use of value parameters within the Bass Diffusion Model and a new Army system for modeling new recruiting campaigns.

## I. INTRODUCTION

IN the following text, we will take the reader through the Systems Decision Process (SDP) and how it applies to our capstone project. The SDP is a four phase process that considers the systems environment, current status, and desired end state. The four phases of the SDP are problem definition, solution design, decision making, and solution implementation. Our paper discusses how each phase of the SDP is generally applied. Then, we discuss how we used each portion of the SDP in our research project. Our project goal is to further develop or improve upon the current and future “Army Strong” communication system which focuses on the opportunities of military service to enhance Army recruiting in order to meet organizational goals and objectives.

## II. PROBLEM SOLVING FRAMEWORK: SDP

### A. Situation

Although the Army has recently achieved recruiting goals, they face an ongoing battle to maintain adequate troop strength and the possibility of troop increases in the face of additional missions. The Army’s desired end state is to have a force large enough to successfully protect the nation’s interests without overworking its service members.

### B. SDP

The SDP is a systems decision making process, involving four phases. The SDP begins with a description of the current state of the system and the initial problem being addressed. After identifying the current state of the system, one uses the four steps of the systems decision process to develop a desired end state. The desired end state is the goal that the new system achieves that makes it better than the previous structure.

### C. Key Stakeholders

Stakeholders consist of the individuals and organizations that have an interest in the problem and its solutions. To determine what the stakeholders deem as important one performs stakeholder analysis which identifies the objectives, functions, and constraints of the problem. This assists with analyzing the relative importance and value of each solution.

The stakeholders in our research project include the United States Army Recruiting Command, Assistant Secretary of the Army, United States Army Accessions Command, Army Brand Group, the youth market, and the soldiers in the United States Army.

### D. Environmental Factors

There are a number of environmental factors that a solution design team must take into consideration during each phase of the SDP. Technological, economic, political, social, cultural, historical, moral/ethical organizational, and emotional factors all play a key role in effecting potential alternatives.

Perhaps the most important environmental factor we consider in our AOCM is the effect that technology plays in recruiting. The youth market today is very technology savvy due to the proliferation of personal computers, laptops, and the internet. Additional mediums include I-Pods, MP3 players, text messaging, AOL instant messenger, Myspace, Facebook, and YouTube. Another factor that affects the environment includes economic factors. Key decision makers are concerned about the economic impact of the new system on their budgets [2]. Political factors are drawn from the many decision groups exist to impact system decisions by private or public

organizations. In addition, many public decisions require approval by government agencies or Congress [2]. Systems have social implications by changing how we work or interact with our associates, friends, and family and we look to draw upon these in our model. Organizational effects often come from the key formal and informal organizational leaders, and they can be important users, consumers, and customers in the decision process [2]. Emotional factors are drawn from the fact that sometimes decision makers or key stakeholders have personal preferences or emotional issues about some systems or potential system solutions [2].

### III. PROBLEM DEFINITION

#### A. The Problem Definition Phase

The end result of the Problem Definition phase is the design problem, a functional hierarchy, and a value hierarchy. The problem definition phase provides a process for helping stakeholders to define their problem. It is important to note that the initial problem defined is usually never the real problem that needs to be addressed [2]. A functional hierarchy is a visual representation of the systems functions and sub-functions which helps guide concept development. A Value Hierarchy reflects the stakeholders' values and is used when comparing alternative solutions.

#### B. Problem Statement

The initial goal of our design team was to create a new marketing system to communicate the values of Army service to the target recruiting population. However, with the introduction of the "Army Strong" recruiting campaign our problem statement changed. Our new goal became to further develop or improve upon the current and future "Army Strong" communication system which focuses on the opportunities of military service to enhance Army recruiting in order to meet organizational goals and objectives.

#### C. Diffusion

One assumption that we had to make to justify our model was whether or not values were adopted through diffusion. After research, we concluded it was. Diffusion is the process by which an innovation is communicated through certain channels over time among members of a social system [3]. Diffusion also encompasses a social change which alters the structure and function of a social system. According to Everett M. Rogers, Professor in the Institute for Communication Research at Stanford University, "When new ideas are invented, diffused, and are adopted or rejected, leading to certain consequences, social change occurs [3]." When new ideas and technology enters society, people either chose to adopt or reject them which results in social change.

#### D. Functional Hierarchy

A functional hierarchy displays the systems functions and sub-functions that are needed to achieve the objectives of the system. The functional hierarchy is used to guide concept development and design, along with identifying performance measures. Our functional and value hierarchies were created, modified, and vetted with our stakeholders to ensure they accurately reflected their objectives. The overall function of

the system is to improve the current recruiting communication system to maximize accessions.

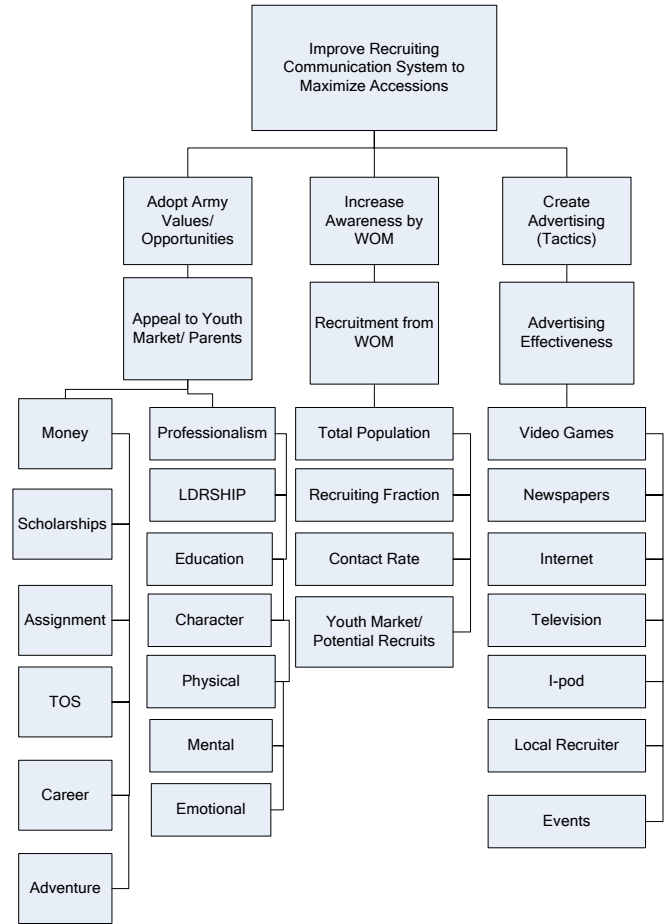


Fig. 1., Functional Hierarchy

#### E. Value Hierarchy

The Value Hierarchy allows us to compare alternatives by quantifying stakeholder values and creating a Total Value Score (TVS) where  $v(x)$  is the value of a candidate solution for  $i=1$  to  $n$ , for the number of value measures. The score of the candidate solution on the  $i^{th}$  value measure is annotated by the variable  $x_i$ ;  $v_i(x_i)$  represents the single dimensional value of the solution on the  $i^{th}$  value measure. The weight,  $w_i$ , is the weight of the  $i^{th}$  value measure [2].

$$v(x) = \sum_{i=1}^n w_i v_i(x_i) \quad (1)$$

As a part of the SDP, we conducted a functional analysis and created a value hierarchy where we determined the fundamental objective, functions, and sub-functions of the system. Figure 2 shows our value hierarchy where we demonstrate how each value measure affects the different functions of the system. Starting at the top and moving down, one can see that 'Appealing to the Youth Market' is a sub-function of the adopt Army Values/Opportunities function. From here, one can see the importance of each value measure. For example, one can see that 'Maximizing Influencer Support'

is important to ‘Appealing to the Youth Market/Parents,’ which is indicated with the bold line. This process can be followed with all the different measures, and it allows us to identify how much weight or importance should be placed on each of the individual measures to best influence our system.

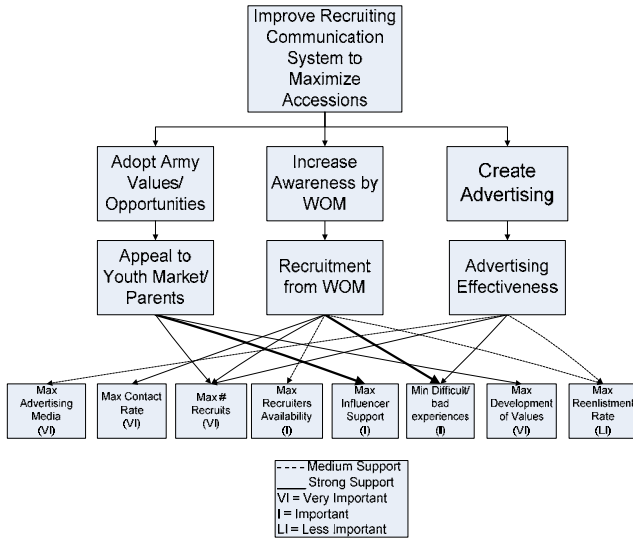


Fig. 2., Value Hierarchy

#### IV. DESIGN & ANALYSIS

##### A. Solution

The solution design process helps to develop a number of feasible alternatives for the user, consumer, and customer to find the better solution. At first, there will be a larger number of alternatives; however, as you continue measure your alternatives against the user, consumer, and customer’s criteria and the problem definition, it will eventually be narrowed down to one or two alternatives. Finding the most effective and efficient alternative as well as an alternative that complements and meets the needs, wants, and desires of user, consumer, and customer is the ultimate goal of the solution design process.

The AOCM helps the stakeholders to develop a level of understanding between the various interacting parts of the system, and of the system as a whole. The AOCM shows how the recruiting effectiveness parameters effect recruiting and how current recruits affect potential recruits. Recruiting Command can utilize this knowledge by changing various input parameters to achieve the desired outputs, or end state.

##### B. Bass Diffusion Model

The Bass Diffusion model is widely used in forecasting, especially product and technology forecasting. The model describes the process how new products are adopted into the market through the interaction between users and potential users [10]. The Bass model is useful during the analysis of diffusion patterns. Additionally, “best guesses” from metaanalysis can be useful for predicting future adoptions, even prior to the launching of a new product. The variables used in the Bass Diffusion Model are presented in Table I.

##### C. Generic Bass Model Parameters

Due to marketing actions, some consumers will adopt the product on their own, without the influence of other consumers. These consumers are the innovators. The coefficient  $p$  is the innovation rate and is influenced by marketing. Marketing is not the only way that consumers find out about a new product. Potential adopters also learn of the product through other consumers, articles, and hear about the product in the media. The greater number of products in circulation equates to a stronger word of mouth force, and it is known as  $q$ , the coefficient of imitation, internal influence or word-of-mouth effect. The average value of  $p$  has been found to be 0.03, and it is often less than 0.01. The average value of  $q$  has been found to be 0.38, with a typical range between 0.3 and 0.5 [4].

TABLE I  
BASS DIFFUSION MODEL

Symbol	Quantity
$f$	Rate of change of the installed base fraction
$F$	The installed base fraction
$p$	Coefficient of innovation
$m$	Ultimate market potential
$q$	Coefficient of imitation
$S$	Sales

##### D. Equations

The Bass Diffusion Model starts with a population of  $m$  potential adopters which is the market potential. For each of these, the time to adoption is a random variable with a distribution function  $F(t)$  and density  $f(t)$ , so that

$$\frac{f(t)}{1 - F(t)} = p + qF(t) \quad (2)$$

The number of new adopters is the rate of adoption times the size of the potential market which results in an equation for new sales.

$$S(t) = m \frac{(p + q)^2}{p} \frac{e^{-(p+q)t}}{\left(1 + \frac{q}{p} e^{-(p+q)t}\right)^2} \quad (3)$$

$$t^* = \frac{\ln \frac{q}{p}}{(p + q)} \quad (4)$$

##### E. Some Applications

DIRECTV used the Bass Diffusion Model in 1993 to produce a 10-year-Forecast of subscribers and to profile most likely subscribers [6]. Additionally, the Bass Diffusion Model has been used for first adoption of all types of new technologies, satellite telephone, new LCD projectors, wireless phone adoptions, satellite radio, and wireless internet [7]-[23]. The Bass Diffusion Model is applicable because it can be used

to forecast the sale of new durable goods. This allows companies to use the analysis to set expectations on product development and to invest in the next generation of technology that ultimately restarts the lifecycle [7]-[23].

#### F. Parameters in the AOCM

The recruiting effectiveness parameters measured in the AOCM are money, college, time of service, jobs, and location of first duty station. These parameters measure how different incentives or contract options effect recruiting. Additionally, the recruiting effectiveness parameters consider how current recruits affect potential recruits.

We began by defining the parameters used in the model. The youth market consists of 17-24 year olds who meet the physical, moral, and educational requirements necessary for enlistment. The youth market aware of the Army includes the 17-24 year olds who meet requirements for enlistment and are aware of the opportunities that enlistment in the Army provides. The average awareness time is the average number of days that it takes a member of the youth market to become aware of the opportunities that the Army provides. The effect of advertising includes the external source of awareness. Recruitment Rate (RR) is the rate at which potential recruits becomes an active recruit. This is driven by advertising efforts, value adoption effect, and the word of mouth effect. Recruitment from Advertising can result from advertising according to the effectiveness of the advertising effort within the pool of potential recruits.

The word of mouth effect is small if the number of active recruits relative to the total population size is small due to a diminished contact rate. The contact rate is the number of contacts each recruiter makes per year. The recruiting fraction is the youth market that is aware of Army opportunities, and has had contact with a recruiter. A contract signed is defined by the number of enlistments per year. Quality marks are the minimum physical, moral, educational, and appearance standards that are required for enlistment in the Army. Quality marks can be increased or decreased depending on the current status of the recruiting market. SRAP refers to Soldiers Recruiting Assistance Program, and it is defined as the number of enlistments that occur from the influence of active duty soldiers. First Unit is defined as the first duty station of a soldier after completing basic combat training and advanced individual training. Recruiters: DEP Referrals: Recruitment from individuals that have signed contracts but have not begun basic training.

In our AOCM we are going to measure how advertising, recruiting effectiveness, SRAP effect recruiting. The AOCM is a simulation model of the Army's recruitment potential and shows how minor or major changes affect the total recruitment process. The model also allows for adjustment of the constants and parameters. This gives our stakeholders a preview of how changing various inputs affect a particular form of recruiting. The framework of our model is based on how the youth market responds to media, people, intrinsic, and extrinsic values.

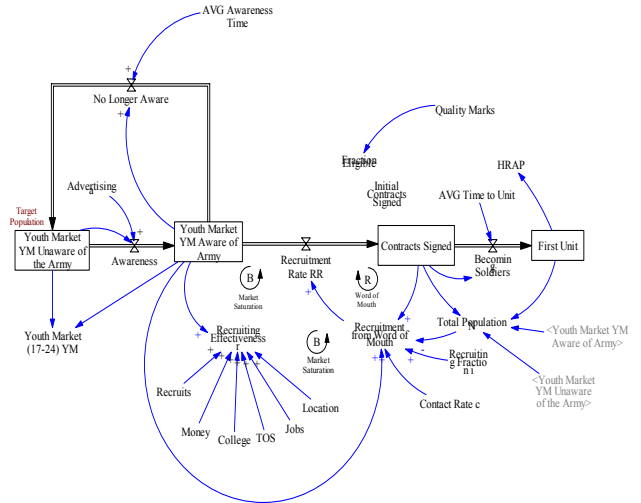


Fig. 3., Army Opportunities Communication Model

## V. DECISION MAKING

### A. Customer-Specific Solutions

After meeting with the Recruiting Command at Fort Knox, Kentucky, the customer desires to use the model for regional and ethnic recruiting analysis. For instance, they might look at the number of African Americans and Hispanics that can be recruited from the south east region. With this information we can then evaluate how different marketing strategies effect different populations and what strategies are more effective in regard to recruiting different ethnicities or regions. Then, in order to show the different effectiveness of the strategies we will decide upon a weight for the different alternatives. If one particular strategy is more valuable in a given circumstance, then we will give that alternative a greater weight than for a strategy that did not work as well.

The data that we will use to run our various simulations will come from USAREC. The Army recruiting command has data that will support analysis of various regional marketing strategies.

### B. Cost Benefit Analysis

We use a cost-benefit analysis to access different regional marketing alternatives. The total value score (equation (1)) is dependent on the alternatives. A plot of the cost and total value score identifies viable alternatives and dominated alternatives. Viable alternatives can create more value for an additional cost. On the other hand, dominated alternatives cost more without adding any additional value.

## VI. IMPLEMENTATION

### A. Implementation

All the recruiting advertisements that are shown on TV and billboards are a product of the Army Brand Group. This group is responsible for all the advertising for the Army and they create the advertisements with what ever information they see fit. However, the Recruiting Command is the actual unit that tracks and is accountable for bringing soldiers into the

Army. Right now these groups do not have very effective lines of communication, but it will be up to the two of them to decide whether or not our model can be of use in both advertising effectiveness and an increased recruitment rate by recruiting effectiveness and word of mouth.

## VII. RESULTS

A. The model results are still pending. We are currently working with Recruiting Command to create a model that focuses of Hispanic and African American marketing.

## VIII. CONCLUSION

Throughout our research we did not find any examples or citations of the Bass Diffusion Model being used for personnel recruiting. This would make the AOOCM the first known use of the Bass Diffusion Model for personnel recruiting. Additionally, the AOOCM presents a unique flow that incorporates national advertising, balking (not adopting), recruiter effect, and various word of mouth advertising strategies. Our model links the United States Military Academy's Department of Systems Engineering Systems Design Process to the Bass Diffusion Model as an evaluation technique.

With creation of the AOOCM, we have provided Army recruitment a framework/mental model for analyzing and critiquing total recruiting effectiveness. Ultimately, the AOOCM adds value to Army recruiting.

## REFERENCES

- [1] "Diffusion of New Products: Empirical Generalizations and Managerial Uses." Vijay Mahajan, Eitan Muller, and Frank M. Bass. *Marketing Science*, Vol. 14, No. 3, Part 2 of 2: Special Issue on Empirical Generalizations in Marketing. 1995, pp. G79-G88.
- [2] Gregory S. Parnell. *System Decision Process Overview: Systems Decision Making in Systems Engineering and Management*. Fall 2006 ed. Wiley.
- [3] Everett M. Rogers. *Diffusion of Innovations*. The Free Press: London, 1983.
- [4] John D. Sterman. *Business Dynamics: Systems Thinking and Modeling for a Complex World*. McGraw-Hill, 2000.
- [6] "DIRECTV: Forecasting Diffusion of a New Technology Prior to Product Launch." Frank Bass and K. Gordon.
- [7] "A Diffusion Theory Model of Adoption and Substitution for Successive Generations of High-Technology Products." John A. Norton and Frank M. Bass. *Management Science*, Vol. 33, No. 9. (Sep., 1987), pp. 1069-1086.
- [8] "Diffusion and Advertising: The German Telephone Campaign." Hermann Simon and Karl-Heinz Sebastian, *Management Science*, Vol. 33, No. 4. (Apr., 1987), pp. 451-466.
- [9] "New-Product Diffusion Models," Vijay Mahajan, Eitan Muller, and Yoram Wind, *Marketing Science*, Published 2000 (Springer) pp. 1-355.
- [10] "The Bass Model: A Commentary." Frank M. Bass, *Management Science*, 50, 12 Supplement, 2004, 1833-1840.
- [11] "A New Product Growth for Model Consumer Durables." Frank M. Bass, *Management Science*, 50, 12, 2004, 1825-1832 (reprinted from January 1969).
- [12] "Generic and Brand Advertising Strategies in a Dynamic Duopoly." Frank M. Bass, Anand Krishnamoorthy, Ashutosh Prasad and Suresh P. Sethi. Accepted for publication in *Marketing Science*.
- [13] "Advertising Competition with Market Expansion for Finite Horizon Firms." Frank M. Bass, Anand Krishnamoorthy, Ashutosh Prasad and Suresh P. Sethi, *Journal of Industrial and Management Optimization* 1, 1 February 2005, 1-19.
- [14] "Virtual Bass Model and the Left-Hand Data-Truncation Bias." Zhengrui Jiang, Frank M. Bass and Portia Isaacson Bass, 2004. Forthcoming *International Journal of Research in Marketing*, 2005.
- [15] "The Shape of the Advertising Response Functions Revisited: A Model of Dynamic Probabilistic Thresholds." Demetrios Vakratsas, Fred M. Feinberg, Frank M. Bass and Gurumurthy Kalyanaram, *Marketing Science*, 23, 1, 2004, 109-119.
- [16] "Optimal Pricing in a Hazard Rate Model of Demand." Suresh P. Sethi and Frank M. Bass, *Optimal Control Applications and Methods*, 24 (4), 2003, 183-196.
- [17] "Why The Bass Model Fits Without Decision Variables." Frank Bass, Trichy Krishnan, and Dipak Jain.
- [18] "Marketing-Mix Variables and the Diffusion of Successive Generations of a Technological Innovation." PJ Danaher and B Hardie.
- [19] "Wireless Diffusion and Mobile Computing: Implication for the Digital Divide." J Wareham and A. Levy.
- [20] "A Diffusion Theory Model of Adoption and Substitution for Successive Generations of High-Technology Products." John A. Norton and Frank M. Bass, *Management Science*, Vol. 33, No. 9. (Sep., 1987), pp. 1069-1086.
- [21] "An Examination of New Product Diffusion Models." Jean-Pierre Van de Capelle, Ph.D, *Marketing Science*. Printing Industry Center at RIT. (Oct 2004), pp. 1-52.
- [22] "Optimal Advertising Policies for Diffusion Models of New Product Innovation in Monopolistic Situations." Engelbert Dockner and Steffen Jorgensen, *Management Science*, Vol. 34, No. 1. (Jan., 1988), pp. 119-130.
- [23] "New-Product Diffusion Models." Vijay Mahajan, Eitan Muller, and Yoram Wind, *Marketing Science*, Published 2000 (Springer) pp. 1-355.